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SOME SUGGESTIONS ABOUT NOURISHMENT IN ACUTE DISEASE.

BY FRANCIS H. WILLIAMS.

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Revised by the author for the Rumford Kitchen.

THERE are few questions in the treatment of disease which have to be decided so often during the daily routine of practice as those which concern the proper support and nourishment of the patient; and, further, there are not many things connected with the care of patients which are so difficult.

It is not easy to find a person competent to prepare suitable food; it is, therefore, the more incumbent upon the physician to be able to give proper directions as to its preparation.

The chief thing is to take pains, and those who can do this are rare people, whether physicians, relatives, or nurses. This is why less is accomplished than there should be in the support of the sick. If we wish to succeed in avoiding nausea, vomiting, and loss of strength and even loss of life, we must learn to offer nourishment to our patients in a suitable form.

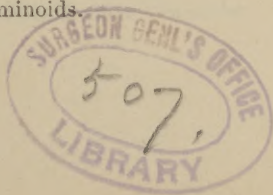
Let me recall to your minds a few of the principles to be kept in view in feeding patients acutely ill.

Foods may be classified as follows:

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| 1. Water. | 4. Sugars (fruits). |
| 2. Salts. | 5. Starches. |
| 3. Fats. | 6. Albuminoids. |

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In Envelope



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The classes of foods known as starches and albuminoids are the ones which require the most care to offer to a patient in a proper form.

Water is of prime importance. Consider for a moment the composition of the body of a man weighing 154 pounds, as illustrated by these blocks. He is 108 pounds water, or about two-thirds.

It does not follow from this that we need give every patient several pints of water a day; by no means, but it is fair to infer that water, of a suitable temperature, should not be denied the sick, and that patients too young, too delirious, or too ill to ask, should not be neglected in this regard. The physician should see to it that water is offered the thirsty economy in all cases, nature demanding it though the patient makes no request. The amount depends on the character of the diet and the disease.

Salts are present in small proportion in most foods, and are essential constituents of our diet.

Fats as a rule are not tolerated by patients acutely ill, and their use should be limited to such forms as are finely divided, as in milk or yolk of egg (and even in milk it may be necessary to reduce the amount of fat by skimming off the cream).

Common sugar must be changed into grape sugar before it is assimilated.

Grape sugar and maltose are very soluble and easily absorbed, and for this reason seem a very desirable form in which to give nourishment.

Fruits are refreshing and valuable to give variety to the diet and to contribute water, which they contain in large proportion. Most fruits contain 85 to 90 odd per cent. of water, some sugar, and the citrates, malates, and tartrates of potassium. Other fruits, such as grapes and bananas, contain sugar in considerable proportion, to 15 per cent., and their value as foods is not to be despised; bananas contain starch also.

Among dried fruits, dates and figs contain 60 per cent. of sugar and 6 per cent. of albuminoids.

The value of certain fruits for persons who are predisposed to uric acid, gravel, and concretions in the bladder I shall not discuss here, though it is well worthy of attention.

Though we take foods into the stomach in the solid form, it is necessary that they be made soluble before they can be assimilated. The classes of foods which we have thus far considered are readily absorbed; namely, water, salts, fats, and sugars; they are all liquid or readily soluble substances. In the remaining classes, starches and albuminoids, we have foods with which there are several steps to be gone through before they can be taken up by the system.

With all starchy foods, like grains, potatoes, and rice, it is necessary to break the starch granules by heating or to change them by fermentation, and before the starch can be absorbed it must be converted into a soluble substance, such as dextrine, which is the same in composition as starch, or into starch sugar or maltose. Starches, therefore, are not absorbed as such, but must first be rendered soluble.

Uncooked starches vary very much in the rapidity with which they may be converted into sugar by the action of the saliva. After thorough cooking, all starches require nearly the same time. It is, therefore, important to have starchy food well cooked before it is given to patients.

As regards *albuminoids*. Wholly without albuminoids, unless the disease is of short duration, the patient cannot exist. Since they are imperatively needed, they should not be omitted from the diet, even where digestion fails almost completely.

Albuminoids are complex in composition and decompose readily, and in their preparation more care is required than with any other kind of food. To avoid decomposition, they should always be fresh; and to prevent losing the albuminoids by coagulation, they should not be heated to too high a point.

To prepare meat foods properly, two things must be borne in mind: 1st. The albuminoids of meat coagulate when heated to boiling. 2d. To obtain a good flavor, the meat must be sub-

jected to a temperature much above the coagulating point of albumen. It is, therefore, necessary to resort to two procedures, one which has for its object to extract the flavor, the other to extract the albuminoids without coagulating them.

If we treat meat with boiling water, we get beef-tea, which contains only a small percentage of solids and almost no albuminoids. This applies to all clear boiled beef-tea. This liquid is of service in two ways: its taste and odor are agreeable, and together with the heat of the hot water, which acts as a stimulant, it makes a valuable article for use in the sick-room, — not as a food, but as a flavoring.

Some of the extracts of meat made with hot water may be used instead of ordinary beef-tea, thus saving much time. Liebig's and other extracts of beef contain no fats or albumen and a little gelatine. It is desirable to use only a small amount of extract, say one-third of a teaspoonful to a teacupful of hot water, as too much gives an unpleasant flavor.

Now as regards the juices of meat which contain albuminoids in solution.

From raw meat one cannot obtain as much juice as is easily expressed from the same amount of meat which has been previously heated. The reason is this: the envelope enclosing the muscular tissue is a tough substance, which swells and dissolves when heated, yielding gelatine, and thus after broiling, the liquid portions of a steak flow out readily. A steak when well broiled swells; if it is cooked too long, the albuminoids coagulate, it loses moisture, shrinks, and becomes tough.

A slightly broiled steak may be cut into square pieces and the juice extracted by a press or by squeezing or twisting in a piece of cotton cloth.

In administering beef juice, great care should be exercised to avoid heating it above 136 degrees F., at which point its albumen coagulates in flakes.

Beef juice, though fourteen times as rich in albuminoids as beef-tea, is so raw in flavor that it is rejected by many palates. To

overcome this objection, it is only necessary to add a proper quantity of any solid extract of beef of good flavor to make it delicious, — about the size of an almond to an ounce of beef juice. Thus by a union of two bodies, one rich in albuminoids and the other rich in flavor, we get something that is superior to either.

Beef juice is an excellent article of diet where solid food cannot be given. A pound of meat yields about four ounces of juice; it therefore costs about five cents an ounce. It is somewhat troublesome to prepare, and should not be kept long.

Soluble albumen, such as is contained in expressed meat juice, is absorbed in the rectum to nearly the same extent as complete peptones. Albuminoids in solution are not precipitated in the stomach and afterwards dissolved, except in the instance of casein of milk, which, as already said, is first coagulated and then dissolved.

Being accustomed to prescribe meat juice, I was much pleased to find on sale a preparation of it manufactured by a well-known firm. I hoped in this to realize all the advantages of beef juice, without its inconveniences. An analysis of this preparation which was made for me was disappointing, as it was found to contain only one-third of one per cent. of albuminoids, compared with 7 per cent. in beef juice; it had also more salt than is desirable, — $12\frac{1}{2}$ per cent. This is mentioned to illustrate the advantage of using foods which are prepared at home, in preference to those made by manufacturers, of which the composition must be taken on trust. This preparation costs thirty-five cents per ounce, though it is only one-twentieth as rich in albuminoids as beef juice costing about five cents.

If one cannot conveniently get albuminoids from meat, a very nutritious broth may be made by means of hot water into which an egg has been stirred. To do this we may heat three ounces of water to not above 149 degrees F., and stir into it a raw egg. The liquid is milky if we use the yolk; clear if only the white is used. It has little taste, which is an advantage with many patients, or it may be flavored with beef extract.

Liquid at a temperature of 149 degrees is apt to burn the tongue. 140 degrees F. is as hot as one can drink a liquid, and 122 degrees F. is a very comfortable temperature for a hot drink.

When these experiments were begun, it was feared that a temperature sufficient to coagulate albumen might be so low as to be lukewarm; but a few tests showed that any temperature which can be borne in the mouth will not coagulate albumen (though these two temperatures differ by only a few degrees).

It is interesting to compare the composition of four liquids containing albuminoid constituents:

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|-------------------------|-------------|------------------------------------|-----------|
| Beef tea, | Beef juice, | Raw egg with $3\frac{3}{4}$ water, | Milk, |
| about $\frac{1}{2}\%$. | about 7%. | about 5% alb. | 4% alb. |
| | | 6% fats. | 4% fats. |
| | | | 4% sugar. |

In all of these we get a good proportion of salts.

It may happen that the digestive organs cannot tolerate eggs, or raw milk. But by means of powders which contain pancreatic ferments — such as Fairchild's peptonizing powders — milk may have its albumen converted into diffusible albuminoids or peptones. In the ordinary process of peptonizing milk, both of these bodies are formed, but the proportion of peptones is small.

Meat albuminoids are converted by the stomach into bodies which are soluble or diffusible, and these substances when artificially produced have been regarded as calculated to render great service in invalid feeding.

It is known that an increased secretion of urea appears after the administration of peptones, just as it does after the ingestion of unaltered albumen, and that the chemical composition of peptones differs little from that of ordinary albuminous bodies. They have the manifest advantage of being easily and immediately absorbed. Peptones, so far as we yet know, may be used during short periods of extreme exhaustion, when perhaps few other albuminoids could be assimilated.

Many preparations have been offered for sale which purport to

be peptones, but which really contain only a small amount of them. Many such preparations are soluble in water, but have a very disagreeable odor and unpleasant taste.

So much in outline for the various classes of foods. Let me now direct your attention to a few suggestive points about the feeding of patients.

Since acute disease is accompanied by fever, we must consider the effect of feeding in cases where the temperature is febrile in character; also, the amount of food, its quality and quantity, together with other conditions affecting its absorption.

In acute disease accompanied by fever, what are the conditions? The body loses weight, urea especially is increased, and carbonic acid and water are excreted in larger amount than in health. All of this loss is not dangerous if allowed to go on for a few days only, and if the amount does not exceed certain limits.

But to replace these losses, we are at a disadvantage as regards the ability of the system to assimilate food. In fevers, the appetite is small, or may be completely lost. The saliva, the gastric juice, the pancreatic fluid, the bile, are less efficient in action or are diminished in amount during high temperature. The stomach is very sensitive, in part perhaps through sympathy with the increased sensitiveness of the nervous system as a whole.

If there is much hyperæsthesia of the digestive tract, as in typhoid, in peritonitis, in dysentery or gastro-enteritis, one must be careful not to give too much food, and it should be in liquid form, and partly predigested.

It is not, however, the administration of food, but the administration of unsuitable food that we have to fear, and also the giving of nourishment in quantities and at times unsuited to the digestive powers of the patient.

One should not give the patient what he cannot digest, nor should we give him less than he can assimilate. The attendant must have a constant watch over the condition of the patient's powers of digestion, and carefully adapt his food to his capabilities, especially during convalescence.

Our attention should be devoted not only to what is put into the alimentary canal, but also to what goes out. For example, if curds of undigested milk are found in the stools of a typhoid patient, the quantity of milk should be diminished, or it should be diluted.

Every careful observer of the sick will agree that many patients are starved in the midst of plenty, simply from the want of attention to the ways which alone make it possible for them to take food.

For example, if the patient has a fever with remissions or intermissions, it is of the first importance to remember that the ability to digest food at these times is greater, and the more nourishing portions of the diet should be given during the remissions and intermissions.

The physician should never lose sight of the patient's likes and dislikes; one cannot diet a patient from a book, or from the chemical composition of foods. On the other hand, it is incumbent upon the physician to know how to choose such a variety in diet as to include both what is palatable and what will afford a proper amount of nourishment.

It has been one of the aims of this paper to show that the preparation of some valuable foods is entirely in our own hands, and that we need not be dependent upon manufactured preparations, of whose composition we are often ignorant; and further to emphasize many details concerning the nourishment of patients, which, though well known and often repeated, are also too often overlooked.

Among other authors, I am indebted to Munk & Uffelman, to Bunge's Physiological Chemistry, and to the recent books on Food by Church and by Yeo, and especially to Mrs. Richards, instructor in Sanitary Chemistry in the Massachusetts Institute of Technology, who kindly made the analyses of beef juice.